

## **5440-11 Mathematics**

*The holder is authorized to teach mathematics in grades 7-12.*

In order to qualify for this endorsement, the candidate shall demonstrate the following:

### Knowledge Standards:

**Demonstrates knowledge of mathematical content, concepts, and skills delineated in current national professional standards<sup>1</sup> and in *Vermont's Framework of Standards and Learning Opportunities* including:**

National Council of Teachers of Mathematics (NCTM) process skills as vehicles for acquiring and using mathematics content knowledge

Typical misconceptions in mathematical reasoning held by early to late adolescents

Specific content recommended for middle grades and high school teachers in *The Mathematical Education of Teachers* (2001, Conference Board of the Mathematical Sciences) including:

*Algebra and Number Theory* – Properties of natural numbers and integers, as well as complex number systems; ways that basic ideas of number theory and algebraic structures underlie rules for operations on expressions, equations, and inequalities; use of algebra to model and reason about real-world situations; use of algebraic reasoning for problem solving and proof in number theory, geometry, discrete mathematics, and statistics

*Geometry and Trigonometry* – Core concepts and principles of geometry in the plane and in space using Euclidean geometry along with Cartesian coordinate and vector methods, and applications to transformations and problem solving; trigonometry from geometric and graphical perspectives, and applications to problem solving

*Functions and Analysis* – Equations and formulas associated with each important class of functions and the way that parameters in these representations determine particular cases; logarithmic functions; how to use functions to solve problems in calculus, linear algebra, geometry, statistics, and discrete mathematics

*Data Analysis, Statistics, and Probability* – Use of surveys to estimate population characteristics, and design of experiments to test conjectured relationships among variables; use of both theory and simulations to study probability distributions, and applications of both theory and simulation in models of real phenomena; conditional probability and independence, and calculation of probabilities associated with these concepts; performance of formal hypothesis tests while applying appropriate statistical testing

*Discrete Mathematics and Computer Science* – Graphs, trees, and networks; enumerative combinatorics; iteration and recursion; conceptual underpinnings of computer science

## **5440-11 Mathematics (Cont'd)**

### Performance Standards:

**Implements a mathematics curriculum that integrates mathematical inquiry skills and mathematical content, and enables conceptual development and development of the habits of mind that support mathematical inquiry. Specifically, the educator:**

Anticipates, elicits, and corrects typical errors and misconceptions in mathematical reasoning through the planning and execution of lessons

Models the habits of mind of flexibility and perseverance that support mathematical learning

Designs and incorporates mathematical tasks/activities that enable students to investigate, explore, and discover structures and relationships; solidify basic mathematical skills; extend and generalize mathematical concepts; create and use mathematical models; apply concrete, formal, and informal strategies to solve mathematical problems; formulate and solve problems individually and collaboratively; and justify and communicate their conclusions orally and in writing

Conveys the real world applications of mathematical ideas, and the interconnections among mathematical ideas and between mathematics and other disciplines

Communicates mathematical ideas using appropriate mathematical language and mathematical representations, and teaches students to use both to communicate about mathematical ideas

Uses required mathematics scoring guides and benchmarks to evaluate student work and teaches students to use both to evaluate their own work

Provides opportunities for students to use appropriate technological tools to explore algebraic ideas and representations of information, study individual functions and classes of related functions, conduct geometric investigations, and solve problems

Conveys to students how the development of mathematical theory and understanding is a historical process with continuous creation of new knowledge and refinement or rejection of “old” knowledge

Conveys to students the roles and responsibilities of mathematicians with respect to social, economic, cultural, and political systems, and provides them with opportunities to actively explore the full scope of career choices available to people in mathematics

Demonstrates sensitivity to inequities in mathematics teaching and careers by incorporating specific instructional strategies that promote equity

### Additional Requirements:

A major in mathematics, or the equivalent in undergraduate and/or graduate coursework in mathematics

A minimum of a practicum, or the equivalent, at the middle/secondary level (7-12) in science, social studies, math, or English.

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<sup>1</sup> e.g. *The Mathematical Education of Teachers* (2001, Conference Board of the Mathematical Sciences), *Principles and Standards for School Mathematics* (2000, National Council of Teachers of Mathematics)